bring the evidence that by means of selective organ stimulation therapeutic effects may be achieved.

The spleen and its relation to resistance to tuberculosis has in recent years been studied extensively, more particularly in connection with mononuclear-cell reactions and the effect of extirpation and roentgenray exposure thereto. It might seem possible that along with the cellular reaction the serum alterations suggested in this paper resulting from roentgenray stimulation of selected organs may have a part in the phenomena of altered resistance to tuberculosis.

Conclusions. By means of selective organ stimulation by roentgen rays in moderate dosage it seems possible to influence the serum enzymes to a considerable degree. Such doses act in stimulating a mobilization of various enzymes; large doses lessen the titer of the serum enzymes.

Raying the hepatic area in dogs resulted in a temporary leukocytosis (with eosinophilia) as well as a well-defined increase in the titer of protease, peptidase, lipase and diastase in the serum.

Raying the intestinal area resulted in a more persistent leukocytosis and a marked mobilization of peptidase; the other enzymes were altered less in proportion.

Raying of the splenic area was followed in general by a diminution of the serum enzymes with the exception of the lipase.

Alteration in the coagulation time of the blood following raying was not confined to raying of the splenic area but followed exposure of the other regions as well. No alterations of complement titer were observed following organ stimulation. The antiferment was usually increased after periods of raying.

THE RELATION OF THE PITUITARY GLAND TO EPILEPSY.

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SINCE the publication of Cushing's memorable monograph on the hypophysis,[1] increasing interest has been directed to the possibility of an endocrine factor or factors as the causative agent of those convulsions which are classed under the broad term "epilepsy." With further knowledge of the functions of these glands the body of evidence as reflected in the literature has rested on the pituitary element as the predominating factor in the so-called "endocrine epilepsies," although some writers following the lead of Laignel-Lavastine[2] believe the thyroid is the glandular element at fault.

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[1] The Pituitary, 1911, W. B. Saunders Company, Philadelphia.

[2] The Internal Secretions and the Nervous System, 1919, Nervous and Mental Disease Publication Company.

For the past year every case of epilepsy coming to the Washington University Dispensary, St. Louis, and remaining under careful observation for a minimal period of three months has been studied from the point of view of a possible endocrine dyscrasia, more particularly one referable to the hypophysis. Our series consisted of 16 cases, representing all types and degrees of presumed epileptic convulsions without regard to any pre-supposed etiological factors except tumors. The average duration of the illness was five and six-tenths years, the extremes being six months and fourteen years.

Each case was investigated according to the following routine procedure:

1. Careful history.
2. Complete general including neurological examinations.
3. Mental tests using the Yerkes-Bridges point scale, in some cases correlated with the Binet-Simon tests.
4. Wassermann reaction on the blood and in several cases the spinal fluid.
5. Ophthalmoscopic examination of the fundus; tests of vision by the usual methods.
6. Visual fields by perimetry.
7. Lateral stereoscopic roentgen-ray plates of the skull.
8. Other examinations when indicated, such as cystoscopy, rhinoscopy, etc.

Before instituting treatment, some experiments to determine the relative potency of various commercial pituitary products were performed in the pharmacological laboratory through the courtesy of Dr. E. K. Marshall, Jr. Using as an index the amount of contraction of the isolated uterus of a virgin guinea-pig, according to the method of Roth,[3] we found a wide variation in the efficacy of the preparations on the market, and even of different lots of the same manufacturer. The least variable were found to be the posterior lobe extract of Parke, Davis & Co. (pituitrin) and the whole gland extract of Burroughs, Wellcome & Co (pituitary extract-whole gland), and these were adopted for this study.

All previous medication was discontinued and the patients were given varying doses hypodermically of one of the above-mentioned products or in a few instances the desiccated whole gland (Burroughs, Wellcome & Co.) by mouth. The average initial dose was 0.5 cc, increasing subsequently according to the tolerance of the patient. The number of ensuing attacks, the amount of pituitary substance administered, and the body weight were carefully charted and will be referred to later.

Before discussing our results a brief summary of each case, detailing only positive findings, may be of value.

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[3] U. S. P. H. S. Hygien. Lab. Bull., 1916, No. 100.

CASE I (W. U. D., A29991).—Miss C. M., aged twenty-two years, whose family and past history were negative, has had convulsions since she was nine years old, during which time she had clonic spasms, more often on the right side. No auræ, hallucinations or delusions. Since her eighteenth year she has often had six attacks daily.

Physical Examination. Hypertrichosis of the upper lip and chin. Pupils equal, right slightly notched. Slight corneal anesthesia. Tongue on protrusion favors the right side. Cardiac examination showed occasional extrasystoles. Pulse-rate, 82. Blood-pressure, 115–80. Abdomen negative. Reflexes entirely normal. Mental examination showed what Dr. G. B. Smith termed a "typical epileptic constitution," with some scattering of the tests and retardation. Blood Wassermann negative (both antigens). Fundi normal. Lateral stereoscopic plates of skull (Dr. S. Moore) disclosed a small, long, shallow sella turcica. Clinoid processes drawn out into a point. The posterior portion of the skull increased in thickness and has general lack of detail in skull structures.

The patient was given an average of 1 cc of the posterior lobe extract weekly for two months, but the attacks became more frequent. Nine months later she reports feeling better since the treatment was discontinued.

CASE II (W. U. D., 38541). Master L. W., aged fifteen years, came of a normal family. Blindness had been discovered when thirteen months old. Attacks began a year ago, and there have been five subsequent convulsions, although for the past three months his mother states that the patient has had daily "spells of unconsciousness," but does not fall.

Physical Examination. Head small, high, narrow. No prognathism. Pupils small and equal. React to light but not to accommodation. Ophthalmoscopy showed a bilateral optic atrophy. Patient has faint light perception. Head otherwise negative. Chest and abdomen negative. Sparse axillary and pubic hair. Normal external genitalia. Blood-pressure, 92–60. Reflexes entirely negative. No Trousseau or Chvostek. No increased excitability to galvanic current. Astereognosis more marked at finger tips than in palm. No sensory changes. Mental tests were applied with difficulty, for there are few tests that fit a patient of this description, especially since he was unable to use his finger tips. There was evidently some mental deterioration not accounted for by his blindness. Deterioration probably progressive. Urine negative. Blood Wassermann negative. No record of roentgenograms of the skull. Posterior lobe given for four months. Whole gland subsequently administered for two months. During this period patient had eight severe and seventeen light attacks, so the treatment was discontinued.

Case III (W. U. D., A8224).—Miss I. K., aged thirty-one years, whose family and past history were negative, has had epilepsy since she was twenty. Convulsions recently have occurred once or twice weekly.

Physical Examination. Facial acne (bromides?). Hypasthenic, rather emaciated. Examination quite negative. Blood-pressure, 96–75. Mental examination showed mental adult age of superior mentality as regards judgment and ability to work. Vision, both eyes, 20–24. Ophthalmoscopic examination: Disk edges blurred and irregular; retinæ pale but vessels normal; deep physiological cupping; visual fields normal. Urine negative. Phenolsulphonephthalein kidney functional test: First hour, 33 per cent; second hour, 13 per cent. Blood Wassermann negative.

Stereoscopic lateral plates of the skull showed practically an approximation of the anterior and the posterior clinoid processes, but no apparent bony bridging. Sella possibly a trifle deepened. Posterior lobe extract given for four months with no amelioration of symptoms.

Case IV (W. U. D., A17278).—Mrs. M. J., aged fifty-two years, negress, had a normal family and past history. Onset of attacks four years ago, with subsequent monthly seizures unaccompanied by auræ.

Physical Examination. Pupils slightly irregular. Reactions normal. Teeth in poor condition (subsequently extracted). A small thyroid is palpable. Romberg, slight swaying. Examination otherwise negative. Blood-pressure, 120–84. Mental tests if anything above the average. If there is any retardation due to epilepsy it is quite slight. Vision: O. D., 20–15; O. S., 20–19. Ophthalmoscopic examination: Beginning cataract lower nasal quadrant of either lens. No abnormalities of the fundus. Visual fields normal. Urine negative. Wassermann on blood negative. Lateral stereoscopic plates of skull: Skull very long; edentulous mouth; sella normal. Posterior lobe extract administered for five months but attacks were not altered in severity or frequency.

Case V (W. U. D., A31551).—Mr. L. R., aged twenty-five years. Father died of tuberculosis (?). When six years old the patient fell on his head and was unconscious for a time. Attacks since twelve years of age accompanied by dryness of the mouth. Now has weekly attacks.

Physical Examination. Entirely normal. Blood-pressure, 108–60. Vision: O. D., 20–30; O. S., 20–19. Ophthalmoscopy negative. Mental age that of adult. No retardation. Blood Wassermann negative. Visual fields normal. Lateral stereoscopic plates of the skull: There is a peculiar circular shadow above the outer orbital process of the frontal bone. The object lies outside the skull. Otherwise negative. Given posterior lobe extract (see Chart I) by hypodermic twice weekly for two months. During this period he had five severe and thirty-six light attacks. The extract of the whole gland and the desiccated whole gland were then administered for seven months, during which the patient gained fifteen pounds. However, there were fifteen severe and thirty-seven light seizures, so the treatment was stopped.

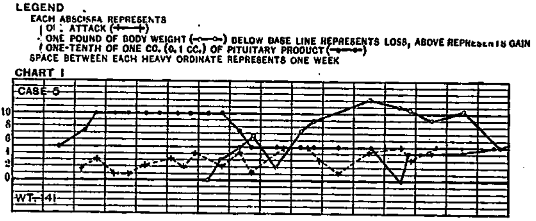

Chart I, Case 5.

Case VI (W. U. D., A31684).—Mr. W. M., aged thirty-nine years, with a negative family and past history, has had epileptic convulsions for nine years not preceded by auræ. They occur at irregular intervals but are becoming more frequent.

Physical Examination. Several scars on head. Slight tremor of face. Teeth and gums in poor condition. Knee-jerk more active on the left. Other reflexes normal. Ophthalmoscopic examination showed normal fundi. Perimetry not done. Blood Wassermann negative. Mental tests showed a typical epileptic mentality with probably a primary mental defect. Scattering of tests, but good coöperation. Memory good for recent but poor for past events. Very emotional. Degeneration will be progressive and there is doubt of his ability to support his family. Lateral stereoscopic plates of the skull: Skull symmetrical, rather thin; sella rather small and its superior opening is very narrow. There are massive clinoid processes and calcification of the pineal body. Posterior lobe extract was given for three months followed by three weeks' administration of the extract of the whole gland, but there seemed no improvement, rather a more marked deterioration.

Case VII (W. U. D., A16197).—Master L. S., aged sixteen years, had a normal family and past history. Has had monthly attacks for a year and a half. The convulsions are preceded by a severe headache, usually starting twenty-four hours before the attack.

Physical Examination. Left septal spur. Hypertrophied middle turbinates. Small adenoid. Tonsils moderately enlarged. Visual fields normal. Vision of both eye 20-15. Ophthalmoscopy normal. Remainder of examination negative. Blood-pressure, 120-80. Blood Wassermann negative. Mental tests showed normal mental state with slight tendency to scattering. Extract of the posterior lobe was given hypodermically twice weekly for five and a half months (see Chart II), and the patient had no attacks. Following a visit to an exciting base-ball game he had four attacks resembling petit mal with no loss of consciousness. An episode of acute bronchitis resulted in a rapid loss of weight and five more attacks of a mild nature. A tonsillectomy was subsequently performed. The extract of the whole gland was substituted for four months, and there have been no ensuing attacks, but the patient has gained eight pounds in weight, or twenty pounds more than during his bronchitis four months before.

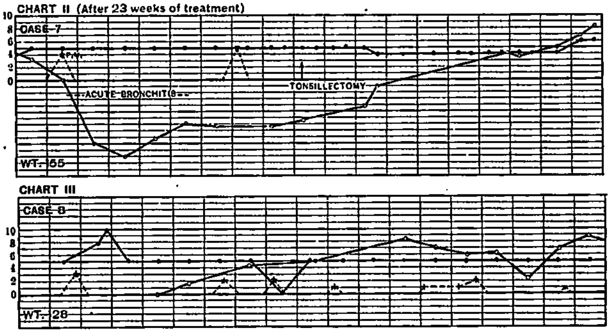

CHART II, Case 7.—After twenty-three weeks of treatment.
CHART III, Case 8.

CASE VIII (W. U. D., 29784).—Miss M. M., aged eighteen years. Her father was an alcoholic and died during an "epileptic fit." Mother has had five or six abortions. Ten brothers and sisters died during infancy—cause unknown. Oldest brother has epilepsy and another brother has very severe headaches (migraine?). Patient's attacks began five years ago and now occur monthly or oftener. Has had enuresis nocturna since early childhood. Some swelling of the feet and ankles recently. Delayed, irregular menses.

Physical Examination. Short, sthenic type. Sparse axillary hair. Breasts rather large. No evidence of hypothyroidism. Reflexes normal throughout. Uterus small, in second degree of retroversion, movable. Adnexa negative. Chronic endotrachelitis. Cystoscopy showed a chronic trigonitis. Urine normal except a faint trace of albumin. Vision (both eyes), 20–15. Ophthalmoscopy, O. D., disk slightly pale, otherwise negative. O. S., disk normal. Perimetry disclosed a bilateral defect in the lower temporal field. Blood Wassermann negative. Mental tests normal. No deterioration or so-called epileptic constitution. Lateral stereoscopic plates of the skull: Skull generally thin; sella is small and the dorsum and posterior clinoid processes are bent forward and apparently bridge the fossa; the roof of the orbit and the great wings of the sphenoid approach the vertical; the frontal bone rises straight up anteriorly; the orbits are rather shallow (?). The diagnosis is suggestive of a mild degree of oxycephaly.

The administration of the posterior lobe extract was instituted for two months (see Chart III), followed by the exhibition of the whole gland (extract or desiccated) for six months, but numerous supervening attacks demonstrated the futility of further use of pituitary treatment despite the eight-pound gain in weight.

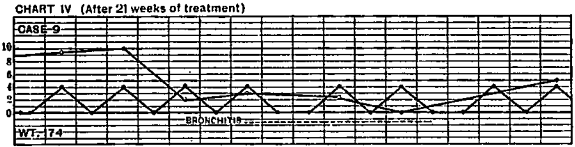

Chart IV, Case 9.—After twenty-one weeks of treatment.

Case IX (W. U. D., A30683).—Mrs. M. Z., aged sixty years, whose family and past history were negative, has had convulsions for six or seven years, occurring every two or three weeks and preceded by vague feelings in the head. There is a definite history of polyuria, the patient claiming she passes three quarts of urine nightly.

Physical Examination. Facial aspect rather suggests an acromegalic, but there are no bony changes in the hands or feet. Ophthalmoscopy negative. Visual fields normal. Moderate emphysema. No arteriosclerosis. Blood-pressure, 100–70. Nervous system negative. Urine normal. Cystoscopy: Bladder negative; both ureters catheterized, negative; urine from both kidneys negative. Blood Wassermann negative. Mental tests show marked retardation that is not entirely accounted for by the language difficulty. No definite psychosis made out. Patient was given the extract of the posterior lobe for two months (see Chart IV) and three attacks occurred. The extract of the whole gland was then substituted and there have been no attacks in eight months.

Case X (W. U. D., A14498).—Miss H. H., aged fourteen years. Father well. Mother has epilepsy and a positive (4 plus) Wassermann, and has had five spontaneous abortions. She has four children younger than the patient; one has "spasms." One child died of "marasmus." Present illness began a year ago, one week after an attack of "influenza." A second convulsion occurred four weeks later, and subsequently there have been attacks every two or three weeks. Tonsils and adenoids removed ten months ago.

Physical Examination. Thyroid slightly enlarged. No exophthalmos, tachycardia, tremor, etc. Further examination normal. Blood-pressure, 102–65. Vision (both eyes), 20–15. Ophthalmoscopy negative. Perimetry showed contracted fields for red and blue in the left eye. Right field normal. Lateral stereoscopic plates of skull negative. Both pituitary preparations were employed for four months, during which time there occurred thirteen severe and thirteen light attacks, although the weight remained almost constant. (see Chart V.)

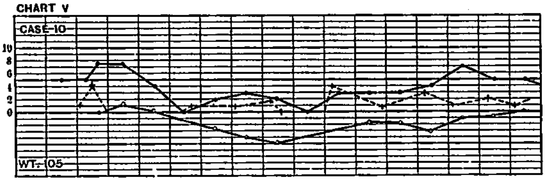

Chart V, Case 10.

Case XI (W. U. D., A15143).—Mrs. C. R., aged forty-nine years. Married seven years. No pregnancies. Has had "typhoid fever" several times. "Nervous breakdown" seventeen years ago. Onset of convulsions three years ago. They now occur every month or two, but are not preceded by auræ. Frequent frontal headaches. Often has pain in epigastrium at no particular time of day. No relation to posture or food.

Physical Examination. Slight hypertrophy of the right inferior turbinate and more on the opposite side. Sinuses clear. Vision: O. D., 20–38; O. S., 20–30. Ophthalmoscopy negative. General examination negative. Gastric test meal normal. Sigmoidoscopy negative. Wassermann on blood negative. Mental tests showed normal reactions. Lateral stereoscopic plates of skull: Skull rather small; posterior fossa projects prominently downward and backward; otherwise negative. For four months the patient was given either of the two pituitary extracts. There were thirteen severe and twenty-five light attacks, while the weight decreased sixteen pounds.

Case XII (W. U. D., 15324):—Mr. F. B., aged thirty-eight years, had a negative family and past history. Onset of epilepsy six years ago, with attacks of dizziness, but generalized convulsions did not occur until a year later. Seizures now once or twice weekly, sometimes once daily. Urinary frequency.

Physical Examination. Pupils rather small, equal and regular. React sluggishly to light. Accommodation reflex normal. Extrinsic ocular muscles negative. Heart showed slight general enlargement. Blood-pressure, 110–74.

Cystoscopy: Internal sphincter relaxed. Much tenderness in posterior urethra. Congested reddened trigone. No trabeculation. Ureteral orifices normal. Urine negative.

Vision (both eyes), 20–30. Ophthalmoscopy showed deep physiological excavation of disks. Perimetry showed normal fields.

Blood Wassermann twice negative. Mental tests showed characteristic epileptic constitution and marked mental deterioration. Deterioration will probably be progressive.

Lateral stereoscopic plates of skull: Skull contour very irregular and skull rather thin. The superior limit of the petrous portion of the temporal bone and the roof of the orbit are almost in a horizontal line, above which the clinoid processes project. There is an enormous increase in the size of the sphenoid sinuses. All other accessory sinuses seem enlarged. The sella turcica is very small and is bridged by the large clinoid processes.

The posterior lobe extract was administered for two months and although the patient gained eight pounds he had eleven severe and eight light attacks. During the previous year his average number of attacks under bromide treatment was for the same period nine severe and five light seizures.

Case XIII (W. U. D., A32397).—Master H. H., aged thirteen years, had a negative family and past history. His first attack occurred a year ago, and he has had four subsequently.

Physical Examination. Small, active boy. Neurologically negative. External genitalia puerile in type. No pubic or axillary hair. Visual fields normal. Vision (both eyes), 20–15. Ophthalmoscopy negative. Mental tests normal. Patient is unusually bright. Wassermann on blood negative. Lateral stereoscopic plates of skull: Skull rather large, symmetrical; sella is small and shallow with large clinoid processes which approach each other. The patient was given extract of the posterior lobe for five months during which his weight remained constant and he had no attacks. Treatment was then discontinued. Four and a half months later his mother reported that he had had no further attacks and was growing taller and stouter.

Case XIV (W. U. D., A33465).—Mr. B. B., aged thirty-two years, had been married twelve years and had four healthy children.

A sister, four years old, could not walk or talk, otherwise his family history was negative. Past history of no importance. Fourteen years ago the patient had his first attack and a second followed a year later. They now occur every three weeks and there are no auræ. Six months ago, for no reason known to him, there began a rapid increase in weight, forty pounds to date.

Physical Examination. Revealed a large, rather stout, but healthy appearing man. There was a fair hair distribution with an increase of adipose. Right pupil larger than the left. Both react well to light and accommodation. Neurologically normal. External genitalia normal. Vision (both eyes), 20–12. Ophthalmoscopy negative. Visual fields normal. Psychic study by Dr. B. C. Marshall showed normal behavior and good insight. Blood Wassermann negative. Lateral stereoscopic plates of the skull: A large hooked process at the external occipital protuberance, otherwise negative. The posterior lobe extract was given for a month followed by two weeks on the desiccated whole gland. As he had no attacks he discontinued further treatment. Seven and a half months later he reported having lost twenty pounds, but was in good health, although at times he became very nervous. There have been no further attacks.

Case XV (W. U. D., A33339).—Miss V. R., aged thirteen years, who had a negative family and past history, has had for the past year and a half momentary spells, when her "mind seemed to leave her," although she was not dizzy and did not fall. First convulsion occurred eight months ago and there have been numerous ones since.

Physical Examination. Entirely negative. Vision (both eyes), 20–12. Ophthalmoscopy negative. Blood Wassermann negative. Mental examination showed no abnormal reactions. Mental age normal. Lateral stereoscopic plates of skull: Skull symmetrical; a slight degree of convolutional atrophy throughout; sella clearly defined and within the limit of normal dimensions. Diagnosis: Increased intracranial pressure. The patient was sent to the St. Louis Childrens' Hospital for further study. While there the spinal fluid was found to have a normal cell count and colloidal-gold curve. Wassermann on blood and spinal fluid negative. Von Pirquet negative. Complement-fixation for tuberculosis 2 plus. Another roentgen-ray examination of the skull suggested oxycephaly. There were no convulsions while in the hospital. The whole gland extract was administered for two and a half months and while she gained six pounds eight attacks occurred.

Case XVI (W. U. D., A39768).—Miss E. C., aged seventeen years, had a negative family history. When four weeks old she had numerous convulsions and her life was despaired of. The attacks then ceased. Six years later there developed a right-sided paralysis (hemiplegia?). Could not walk, talk or use the right arm. In six weeks she was able to walk. Since then she has always been nervous, but recovered from the paralysis. Nine years ago, during a thunder-storm, she had convulsions. Six months ago while abed with "influenza" she became unconscious. Since that time she has daily attacks which she describes as "choking in the throat." They occur two to six times daily, but there are no auræ or convulsions.

Physical Examination. Rather undeveloped. Does not appear her age. Small thyroid palpable. No pulsation, bruit, etc. Cold extremities. No dermographism. Vision (both eyes), 20-19. Ophthalmoscopy negative. Visual fields normal. Mental tests: Grades up to a normal mental age level; marked memory defect both for numbers and words. Lateral stereoscopic plates of the skull: Skull long and not deep; sella small and shallow; very large dorsum sellæ and posterior clinoid processes; roofs of the orbit approach the vertical and join the inner table of the skull well up on the posterior aspect of the frontal sinuses; all accessory sinuses are large. Diagnosis: Indeterminate, suggestive of acromegaly of incomplete type.

The extracts of the posterior lobe and of the whole gland were given for two months. At the termination of that period the patient stated that the attacks are slightly less severe, although there is little change in their number. She feels much stronger, although there has been an intervening attack of mumps.

In analyzing the foregoing cases we attempted to use as criteria for study the following points:

1. Symptoms or physical signs referable to the hypophysis.
2. Abnormalities in mental reactions.
3. Roentgenographic changes in the sella turcica.
4. Fundus changes.
5. Abnormalities of the visual fields.
6. Body weight.
7. Number and character of the attacks.
8. General health of the patient.

1. *Symptoms or Physical Signs Referable to the Hypophysis.* Five cases (31 per cent of the total) displayed one or more features possibly ascribable to pituitary changes, and it is interesting to note that Tucker[4] in his larger series had the same incidence. The patients presenting these changes were (1) Case I, hypertrichosis of the chin and upper lip. (2) Case VIII, short, sthenic individual; abnormal fat distribution; sparse axillary hair (delayed, irregular menses) suggested an incomplete dystrophy adiposo genitalis. (3) Case IX, polyuria; acromegalic facies. (4) Case XIII, small stature; infantile genitalia; no pubic or axillary hair. (5) Case

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[4] Tr. Sect. of Nerv. and Ment. Dis., Am. Med. Assn., 1919, p. 169, also Arch. Neurol. and Psychiat., 1919, 2, 192.

XIV, gain of forty pounds in six months; body contour and fat distribution suggested a hyposecretion of the posterior lobe.

2. *Abnormalities in Mental Reactions.* These were found in 6 cases (37 per cent) and varied from scattering of tests, retardation, memory defects, to marked mental deterioration. Three patients (19 per cent) showed what Dr. Smith terms a "typical epileptic constitution." He characterizes this group by their feeling of superiority, their superciliousness and diffidence. They are emotional, suspicious and irritable, and these differences are accentuated before attacks (see Cases I, VI and XII).

3. *Roentgenographic Changes in the Sella Turcica.* Discussion has been rife concerning the changes about the pituitary fossa demonstrable by the roentgen ray, and any consequent pressure or other effect on the contained gland. Johnston and his associates [5, 6, 7] claim that in essential (*i. e.*, "idiopathic") epilepsy there is a condition of "local acromegaly" characterized by large clinoid processes, roofing of the fossa, increased density of bony tisssues forming the roof of the orbits, etc., and claim to have found one or more of these features in a very high percentage of cases. Timme[8] insists that roentgen-ray changes in the sella are not indicative of pituitary lesions, but claims that such a feature as "a closing in of the sella turcica" may be found. However, Munson and Shaw[9] think there are no constant changes in the pituitary gland from an anatomical point of view in these subjects, and the former author[10] as a result of autopsies on 85 epileptics at the Craig Colony draws the following conclusions: "The sellas from a series of unselected epileptic subjects present a wide variation in type. The average size seems a trifle smaller than the figures given for normals and the contained gland seems to weigh less. Roofing will be seen in the roentgenogram, but in reality the gland is well exposed and pressure seems a remote possibility. Bony changes are present but seem to be the anomalies which might well be present in a similar series of non-epileptic cases. There is no characteristic change to be seen in epileptic sellæ."

After these important observations by Munson it is noteworthy that 8 cases (50 per cent) in our series showed sellar changes (Cases I, III, VI, VII, VIII, XII, XIII, XVI), but that only 3 (Cases VII, XIII and XVI) improved under pituitary treatment. Two patients (Cases IX and XIV) who had unquestioned evidence of pituitary disturbance, and who did well under the gland administration, had roentgenographically normal sellæ.

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[5] Am. Jour. Roentgenol., 1914, n.s., **1**, 172.

[6] New York State Jour. Med., 1916, **16**, 559.

[7] Pennsylvania Med. Jour., 1914–15, **18**, 429. Also Jour. Nerv. and Ment. Dis., 1914, **41**, 495.

[8] Arch. Neurol. and Psychiat., 1919, **2**, 240; Arch. Ophth., 1920, **49**, 268.

[9] Arch. Int. Med., 1914, **14**, 393.

[10] Ibid., 1918, **21**, 531.

4. *Fundus changes* were displayed by 3 patients (Cases II, III, VIII); 1 instance of slightly pale disks, 1 in whom the disk edges were blurred and irregular with pale retinæ and 1 case of bilateral optic atrophy.

5. *Abnormalities of the visual fields* were discovered in only 2 cases (VIII, X), 1 of whom showed a bilateral temporal defect and the other a unilateral contraction of the fields for red and blue. If, as is contended by Bell,[11] Cushing,[12] Engelbach and Tierney[13] and others, these "pituitary epilepsies" are due to pressure against the uncinate gyrus, it would seem rational to anticipate evidence of similar and coincident pressure on one or both of the optic nerves, probably at the chiasm, but the low evidence of changes in the fundi or visual fields, as found in this and other studies of epilepsy, would militate against such a hypothesis.

6. *Body Weight.* Numerous authors have noted loss of weight when pituitary gland was administered over long periods, some claiming that emaciation ensues. Bell[14] found that a few guinea-pigs gained weight during pituitary feeding and Burch[15] reports a patient who gained while taking the anterior lobe, but these findings are not correlated with other essential data or controls, and hence are of doubtful value.

In our series the weight curves presented wide variations, irrespective of the type of product employed, the increase or diminution in the number of attacks and without any dietary change by the patient. As a matter of fact there was a lower average gain by the cases that improved (0.77 pound per week) than in the unimproved patients (1.66 pounds per week).

Gain in weight .	6 cases (37 per cent)	(Cases V, VII, VIII, IX, XII, XV)
Stationary . .	5 cases (31 per cent)	(Cases II, IV, X, XIII, XVI)
Loss	4 cases (25 per cent)	(Cases III, VI, XI, XIV)

The changes in weight were about evenly divided between the improved and unimproved cases, as follows:

Improved Cases: Gain, 2 cases (Cases VII, IX). Stationary, 2 cases (Cases XIII, XVI). Loss, 1 case (Case XIV). Gain per patient per week, 0.77 pound.

Unimproved Cases: Gain, 4 cases (Cases V, VIII, XII, XV). Stationary, 3 cases (Cases II, IV, X). Loss, 3 cases (Cases III, VI, XI). Gain per patient per week, 1.66 pounds.

7. *Number and Character of Attacks.* There seems to be considerable variance of opinion concerning the efficacy of pituitary treatment in stopping or diminishing the attacks. Clark[16], [17] and

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[11] The Pituitary, 1919, Baillière, Tindall & Cox, London.

[12] Ibid., 1911, W. B. Saunders Co., Philadelphia.

[13] Medicine and Surgery, 1918, **2**, 466 and 549.

[14] Loc. cit. The Pituitary, 1919, Baillière, Tindall & Cox, London.

[15] Journal-Lancet, Minneapolis, 1920, **40**, 53.

[16] Jour. Am. Med. Assn., 1914, **63**, 1652.

[17] New York Med. Jour., 1914, **99**, 5.

Prior and Jones[18] report no success from this method of procedure. Timme[19] holds that feeding with the anterior lobe alone "produces marked improvement and even cures the disease" in many epileptics of the Froehlich dystrophy type; and Joughin[20] reports a case of this group. Tucker[21], [22] states that "good results with pituitary feeding need be expected only when the patient has some clinical evidence of hypopituitarism, and this should be backed by roentgenographical evidence."

How fallacious this line of reasoning is has been demonstrated by the fact that there were 5 cases (31 per cent) that improved definitely under treatment, and of this class 2 showed evidence of hypopituitarism and 2 others showed no roentgen-ray evidence of change in the sella turcica.

It was curious that none of our patients had so-called "uncinate attacks," and in fact few had any auræ, and none had auræ of an olfactory or gustatory nature.

The number and character of attacks in the unimproved cases were apparently not influenced by the treatment. In several instances there were more numerous seizures than when the patient had been under the influence of bromides, but there seemed no progressive increase as a result of the pituitary products, nor in any case was a change observed in the type of the attack. However, in several of the improved cases it is possible that the major fits alone were diminished. Thus Case XIV reports feeling "nervous" frequently, which may represent the equivalent of petit mal attacks, and Case XVI insists that while there seems no decrease in the number of attacks they are diminished in severity.

It might be apropos to state here that our experience with the amount of pituitary substance to be administered, while naturally varying with the size and age of the patient, has convinced us that in those cases amenable to this therapy much smaller doses (0.5 cc once or twice weekly) than are usually employed will prove sufficient. Conversely, in those patients not improved any amount of the gland may be used without more satisfactory results.

8. *General Health of the Patient.* This has proved of little prognostic value, for, as a rule, the patients did well under observation, and, as has been shown above, the average gain in weight was slightly greater for the unimproved cases than for those who were benefited by the treatment. Two of the improved cases developed attacks of acute bronchitis (see Charts II and IV) during the treatment, but despite a rather rapid loss in weight soon regained their previously augmented weight level.

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[18] Jour. Ment. Sci., London, 1918, **64**, 30.

[19] Arch. Neurol. and Psychiat., 1920, **3**, 601.

[20] New York Med. Jour., 1916, **104**, 693.

[21] Virginia Med. Semi-Monthly, 1916–17, **21**, 1.

[22] Tr. Sect. of Nerv. and Ment. Dis., Am. Med. Assn., 1919, p. 169, also Arch. Neurol. and Psychiat., 1919, **2**, 192.

Conclusions. While our comparatively small series of cases and the length of time they were kept under observation do not permit us to be dogmatic, the following conclusions seem justifiable:

1. Certain cases are apparently benefited by pituitary gland administration. In our series 5 cases, or 31 per cent.
2. The preferable product seems to be the extract of the whole gland, and the most satisfactory mode of treatment is hypodermically.
3. No cases showing the "typical epileptic constitution" were benefited.
4. There was no improvement in those patients with abnormalities of the fundi or visual fields.
5. Neither physical signs referable to the hypophysis, mental reactions (except the "typical epileptic constitution"), changes in the sella turcica demonstrable by the roentgen ray or variations in weight or health offered any criteria by which the relative degree of success or failure of the treatment could be predicted.

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NOTE.—On account of the length of this article a number of the charts have been omitted.